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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/671,271	09/24/2003	Shih-Ching Sun	JCLA11935	6548

23900 7590 04/06/2007

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EXAMINER	
HUNG, YUBIN	
ART UNIT	PAPER NUMBER
2624	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/06/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/671,271	SUN ET AL.	
	Examiner	Art Unit	
	Yubin Hung	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *9/24/03* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

- P. 3, line 11: "sys area" should have been "eye area" (per P. 10, line 10 of the specification); also for clarity consider changing "rate" to "aspect ratio" since clearly the intent is to determine the shape (elongated or not) of the eye area (per P. 3, line 12 of the specification)

Appropriate correction is required.

Claim Objections

2. Claims 3, 5, 6, 15 and 16 are objected to because of the following informalities:

- Claim 3, last line: for clarity consider changing "skin color region" to "skin color segmentation" (per P. 7, lines 3-15 of the specification, especially lines 3 and 13-15)
- Claim 5, line 4: for clarity consider changing "rate" to "aspect ratio;" do the same for claim 15

- Claim 5, line 4: per P. 10, line 10 of the specification "the sys area" should have been "the eye area"; the same applies to claim 15. [Note: for examination purpose "sys" will be interpreted as "eye"]
- Claim 5, line 7: for clarity add "(MRB)" after "rectangle box;" do the same for claim 15
- Claim 6, line 3: "slop" should have been "slope;" the same applies to claim 16
- Claim 6, lines 5-6: for clarity consider changing "when eye areas of two eye candidate" to read "when the areas of the two eye candidates" (per P. 10, lines 20-21); do the same for claim 16
- Claim 6, line 10: "setting an luminance" should have been "setting a luminance;" the same applies to claim16

Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 6-12 and 16-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claim 6, and similarly claim 16, recites the limitation "if the difference is *with* a predetermined range" in line 13 that is vague since it is not clear whether the difference is *within* or *outside of* the range; therefore the mete and bound of the claim cannot be ascertained. [Note: per P. 11, lines 12-13 of the specification, for examination purpose "with" will be interpreted as "within."]

Claims 7-12 (depend from claim 6) and 17 and18 (depend from claim 16) inherit the same problems and are similarly rejected.

6. Claim 7, and similarly claim 17, recites the limitation "face symmetric verification" in lines 2-3. This term is not a standard term in the art and is not defined in the specification; therefore the mete and bound of the claim cannot be ascertained.

Claim 8 inherits the same problem and is similarly rejected.

7. Claim 8 recites the limitation "symmetrical difference" in line 2. This term is not a standard term in the art and is not defined in the specification (the closest thing is

"symmetry value" in P. 11, lines 20-21); therefore the mete and bound of the claim cannot be ascertained. [Note: per P. 11, lines 20-21 of the specification, for examination purpose "symmetrical difference" will be interpreted as "symmetry value."]

8. Claim 8 further recites the limitation "the selected one" in the last line. There is insufficient antecedent basis for this limitation in the claim. [Note: for examination purpose "the selected one" will be interpreted as "selected."]

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1, 2, 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Center, Jr. et al. (US 6,680,745), and further in view of Chai et al. ("Face Segmentation Using Skin-Color Map in Videophone Applications," IEEE T. Circuits and Systems Technology, Vol. 9, No. 4, June 1999, pp. 551-564) and Luo (US 6,151,403).

11. Regarding claim 1, and similarly claims 13 and 14, Center discloses

- receiving an image data (in a YCbCr color space)
  [Fig. 1: "camera", "locate face;" Fig. 5: "Current image." Note that the use of YCrCb space is taught by Chai, see below]
- (using a Y component of the image data to) analyze out a motion region
  [Fig. 5: "motion detection;" Fig. 7; Col. 3, lines 25-36; Col. 5, lines 25-60, especially 43-47. Note that a motion region is indicated by non-zero values. Note further that the Y component of Center, while representing the luminance, is from the YUV color space (Col. 3, lines 50-51); the use of YCrCb space is taught by Chai, see below]
- (using a CbCr component of the image to) analyze out a skin color region
  [Fig. 5: "Color Analysis;" Fig. 12; Col. 3, lines 25-36; Col. 7, lines 5-7, 17-20 and 28-31. Note that a region with a non-zero value is a skin region. Note further that the color components of Center are from the YUV color space (Col. 3, lines 50-51); the use of YCrCb space is taught by Chai, see below]
- combining the motion region and the skin color region to produce a face candidate
  [Fig. 5: "Combination of Results;" Fig. 13; Col. 3, lines 25-36; Col. 7, line 50-Col. 8, line 21]

Center does not expressly disclose using the YCrCb color space for skin color region detection, which is disclosed by Chai [P. 553, right column, last 8 lines]. The two references are combinable because they both have aspects that are from the same field of endeavor of face detection and the motivation for modifying Center by using YCrCb is provided by Chai in the same passage cited above.

The combined invention of Center and Chai does not expressly disclose the following but Luo does

- performing an eye detection process on the image to detect out eye candidates
  [Fig. 2a, refs. S6, S8, S14 & S16; Fig. 6 (multiple eye candidates; note that claim 14 requires at least two eye candidates); Col. 4, lines 35-61; Col. 5, lines 28-34; Col. 6, lines 53-55]
- performing an eye-pair verification process, to find an eye-pair candidate from the eye candidates, wherein the eye-pair candidate is also within a region of the face candidate
  [Fig. 2a: refs. S20-S24; Figs. 6-8 & 10; Col. 6, line 53-Col. 8, line 3. Note that since all pairs of eyes are from the same flesh region (Fig. 2a, ref. S20 and Col. 6, lines 64-Col. 7, line 1; note that a flesh region is considered a potential face candidate, per Col. 7, lines 27-

42), the eye-pair candidate is also within the same region (a face candidate)]

The combined invention of Center and Chai is combinable with Luo because they both have aspects that are from the same field of endeavor of face detection.

At the time of the invention it would have been obvious to one of ordinary skill in the art to modify the combined invention of Center and Chai with the teaching of Luo in the manner recited above. The motivation would have been to further ascertain a region as a face candidate, as indicated by Luo in figure 10 and column 7, lines 27-42. [Note that while the main purpose of Luo is to eventually determine whether to eliminate a pair as an eye-pair candidate, this is achieved by determining whether a region containing the pair is a face (by verifying its symmetry). Therefore the determination that a pair is an eye-pair candidate also provides a strong piece of evidence that that the region containing the pair is a face candidate.]

Therefore it would have been obvious to combine Chai and Luo with Center to obtain the invention as specified in claim 1.

12. Regarding claim 2, the combined invention of Center, Chai and Luo further discloses

- wherein a Cb value is between 77 and 127, and a Cr value is between 133 and 173
  [Chai: P. 555, left column, lines 9-13]

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13. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Center, Jr. et al. (US 6,680,745), Chai et al. ("Face Segmentation Using Skin-Color Map in Videophone Applications," IEEE T. Circuits and Systems Technology, Vol. 9, No. 4, June 1999, pp. 551-564) and Luo (US 6,151,403) as applied to claims 1, 2, 13 and 14 above, and further in view of Hong et al. (US 6,999,634).

14. Regarding claim 3, the combined invention of Center, Chai and Luo discloses all limitations of its parent, claim 1. In addition, Center further discloses performing frame difference on the Y component for motion detection [Fig. 7; Col. 5, lines 25-30; note that a difference frame is also an image]. Further, by combining the motion detection result with the color detection result the probability that a region with a color similar to a face (but actually is not) that is detected using color alone is determined as a face candidate can be reduced if the probability of motion in the region is low [see Center: Fig. 13 and Col. 8, lines 6-22] and therefore can reduce false alarm (i.e., a region being erroneously determined as a face candidate—such a problem is well known in the art, see, for example, Col. 1, line 49-Col. 2, line 7 Cosatto et al. US 5,864,630) caused by using color alone; therefore by also using motion detection a drawback of the skin color region (segmentation) is compensated.

The combined invention of Center, Chai and Luo does not expressly disclose the following but Hong does

- wherein an infinite impulse response type (IIR-type) filter is applied to enhance the frame difference
[Col. 7, lines 29-34. Note that since a difference frame is still an image, the IIR filter can be applied to reduce the noise; note further that the image is enhanced because the noise is reduced]

The combined invention of Center, Chai and Luo is combinable with Hong because they both have aspects that are from the same field of endeavor of image processing.

At the time of the invention it would have been obvious to one of ordinary skill in the art to modify the combined invention of Center, Chai and Luo with the teaching of Hong in the manner recited above. The motivation would have been to reduce noise while preserving edge/detail, as Hong indicates in Col. 7, lines 24-26.

Therefore it would have been obvious to combine Hong with Center, Chai and Luo to obtain the invention as specified in claim 3.

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15. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Center, Jr. et al. (US 6,680,745), Chai et al. ("Face Segmentation Using Skin-Color Map in Videophone Applications," IEEE T. Circuits and Systems Technology, Vol. 9, No. 4, June 1999, pp. 551-564) and Luo (US 6,151,403) as applied to claims 1, 2, 13 and 14 above, and further in view of Bloomberg (US 5,467,410).

16. Regarding claim 4, the combined invention of Center, Chai and Luo discloses all limitations of its parent, claim 1. In addition, Luo further discloses labeling flesh regions (i.e., face candidates) that have a size larger than a threshold [Col. 4, lines 12-25].

The combined invention of Center, Chai and Luo does not expressly disclose eliminating candidate regions with a relatively smaller label value.

However, Bloomberg discloses labeling regions by their size and removing regions if their sizes (i.e., their labels) are smaller than a threshold [Fig. 3A; Col. 1, lines 45-52 and Col. 6, lines 6-14 (labeling by size and thresholding)].

The combined invention of Center, Chai and Luo is combinable with Bloomberg because they both have aspects that are from the same field of endeavor of segmentation.

At the time of the invention it would have been obvious to one of ordinary skill in the art to modify the combined invention of Center, Chai and Luo with the teaching of Bloomberg in the manner recited above. The motivation would have been so that noise (such as regions that are too small to be a face candidate in face detection application) can be easily identified (e.g., by comparing the label to a threshold) and eliminated, as Bloomberg indicates in Col. 6, lines 16-17.

Therefore it would have been obvious to combine Bloomberg with Center; Chai and Luo to obtain the invention as specified in claim 4.

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17. Claims 5 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Center, Jr. et al. (US 6,680,745), Chai et al. ("Face Segmentation Using Skin-Color Map in Videophone Applications," IEEE T. Circuits and Systems Technology, Vol. 9, No. 4, June 1999, pp. 551-564) and Luo (US 6,151,403) as applied to claims 1, 2, 13 and 14 above, and further in view of Abdel-Mottaleb et al. (US 6,263,113).

18. Regarding claim 5, and similarly claim 15, Luo further discloses eliminating a connected region as a candidate of a flesh region (e.g., a face candidate) using the following criteria (the 2nd and the 3rd are with respect to a bounding ellipse, see Col. 4, lines 26-28):

- if its area is out of a range [Col. 4, lines 12-14]
- if it has a long shape [Col. 4, lines 28-35; note that the aspect ratio (i.e., rate) reflects the elongatedness of the object]
- if it has proper density regulation (i.e., whether it has a small area but a large MRB) [Col. 4, line 31-35. Note that the compactness measure of Luo corresponds to the density regulation. Note further that Luo does not expressly disclose using a minimal rectangle box for the eye; but this is taught by Abdel-Mottaleb, see below]

Luo further discloses estimating the length and the orientation for an eye candidate [Col. 4, lines 36-47].

The combined invention of Center, Chai and Luo expressly discloses neither eliminating regions as eye candidates using the criteria for face regions recited above nor enclosing an eye candidate with a minimal rectangle box (MRB) for evaluating density regulation (i.e., compactness).

However, it would have been obvious to one of ordinary skill in the art to apply the same criteria for face candidates (as disclosed by Luo and described above), in addition to the length and the orientation, to determine whether regions are eye candidates. This is because eyes and faces both have their respective shape characteristics and by additionally incorporating similar criteria (for faces) to analyze the shape of regions to determine whether they are eye candidates, better accuracy can be expected since additional criteria have to be satisfied.

In addition, Abdel-Mottaleb discloses analyzing shape (for face detection) by enclosing connected components with bounding boxes [Col. 4, lines 29-33] and two of the shape analysis criteria used there are aspect ratio (i.e., rate of candidate area) and compactness (i.e., density regulation) [Col. 4, lines 39-46; note that per the analysis above the criteria can be obviously applied to eye detection].

The combined invention of Center, Chai and Luo is combinable with Abdel-Mottaleb because they both have aspects that are from the same field of endeavor of face detection.

At the time of the invention it would have been obvious to modify the combined invention of Center, Chai and Luo with the teaching of Abdel-Mottaleb by using a bounding rectangle for potential eye candidates. The motivation for using a bounding box, rather than an ellipse as disclosed by Luo, would have been because fitting an ellipse is much more computation intensive; therefore computation cost can be reduced by using a bounding box, as one of ordinary skill in the art would have known.

Therefore it would have been obvious to combine Abdel-Mottaleb with Center, Chai and Luo to obtain the invention as specified in claim 5.

Allowable Subject Matter

19. Claims 6-12 and 16-18 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

20. The following is a statement of reasons for the indication of allowable subject matter:

A. Regarding claim 6, and similarly claim 16, closest art of record does not disclose, teach or suggest all limitations. Specifically,

- Lin et al. ("Locating the Eye in Human Face Images Using Fractal Dimensions," IEE Proc. Visual Image Signal Processing, Vol. 148, No. 6, Dec 2001, pp. 413-421) discloses verifying whether the orientation of an eye pair is within 45 degrees [P. 416, Sect. 3.2, 1st paragraph]
- Held et al. (US 6,885,766) discloses verifying eye pair candidates using its orientation and the distance between the two eyes [Fig. 5 and Col. 8, lines 44-55
- Luo (US 6,151,403) further discloses verifying that an eye pair candidate's orientation satisfying a different set of criteria [Fig. 7 and Col. 7, lines 1-9] and applying a bounding box to a face candidate for symmetry verification [Fig. 10 and Col. 7, lines 27-42].

However, none of the above-cited references, alone or in combination, discloses, teaches or suggests comparing the difference of between the averaged luminance values of the center portion and the reminder of a luminance image in order to select an eye pair candidate, as recited in claim 6.

Conclusion and Contact Information

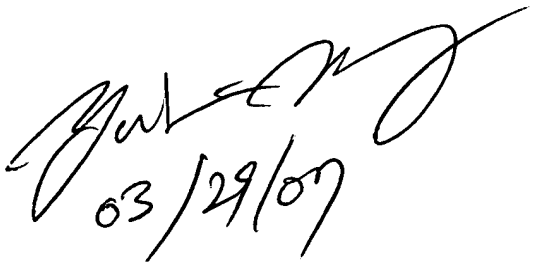
21. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- Cosatto (US 5,864,630) – discloses analyzing shape, color and motion for face detection [Fig. 1A]
- Kim et al. (US 2004/0017930) – disclose combining the probability distributions (of pixels belonging to a face region) based on color and motion to locate candidate face regions [Fig. 1]
- Lu et al. (US 2006/0233442) – discloses using color (in YCrCb color space) segmentation and shape analysis to detect face candidates and subsequently locating eyes from face candidates; motion is separately detected [Fig. 7; P. 6, paragraphs 116, 122-126]
- Hwang et al. (US 5,832,101) – discloses applying IIR to extract edges for subsequent motion detection [Fig. 3; Col. 7, lines 38-59]
- Tao et al. ("Automatic Localization of Human Eyes in Complex Background," IEEE Int'l Symposium on Circuits and Systems, Vol. 5, 26-29 May 2002, pp. V669-V672) – discloses verifying eye candidates using criteria such as shape and area [P. V-670, left column, 1st paragraph]

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yubin Hung whose telephone number is (571) 272-7451. The examiner can normally be reached on 7:30 - 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew C. Bella can be reached on (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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March 29, 2007